In view of the simplifying assumptions made, the agreement is good. However, the result is also likely to have been affected by the impurities present in the natural crystal.

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2

A SEMI-CIRCULAR MAGNETIC SPECTROMETER WITH AIR-CORED COILS.

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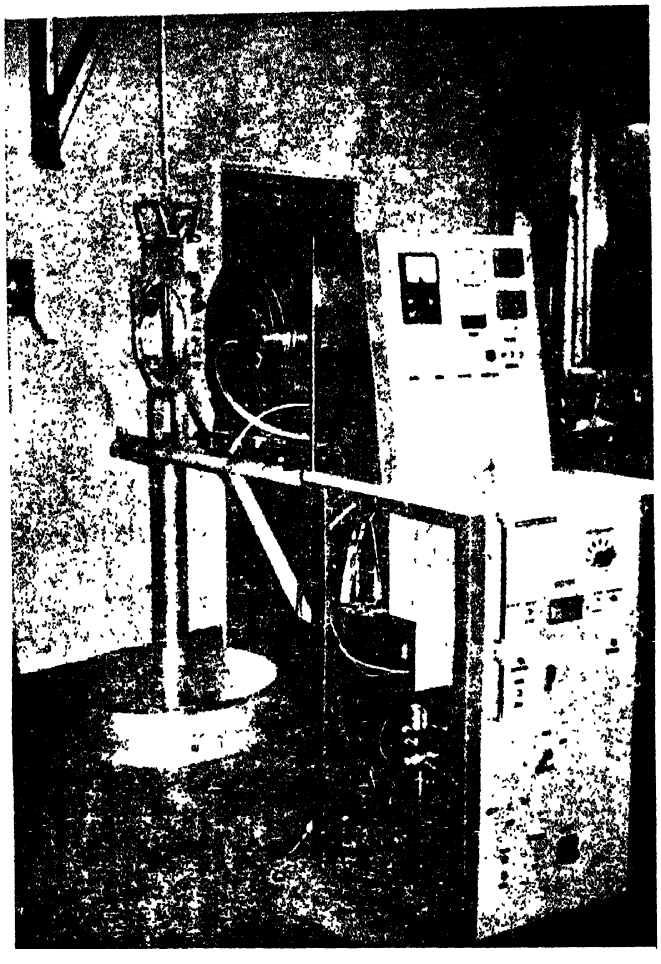
Conversion electrons furnish important details, concerning the multipolarity of the gamma-transitions, and enable us to establish nuclear disintegration schemes. The decays of excited nuclei, due to neutron deficiency, electron capture, or emission of β^+, are particularly favoured for the simultaneous analysis of the momenta of conversion electrons, because of the absence of the continuous β-spectrum. We describe below the construction of a semi-circular magnetic spectrometer, considered to be an excellent momentum analyser.

The magnetic field. The magnetic induction is provided by air cored bobbins of ellipsoidal geometry, having $\frac{\Delta B}{B} = 5.10^{-4}$ over a radius of 15 cm in the median plane (Antony, 1967). The importance of iron-free bobbins lies in the elimination of pronounced inhomogeneities, which are characteristic of fields employing iron, in the region of low magnetic induction. Thus, the spectrometer can be employed to study electrons of energies < 20 Kev. The excitation current is stabilised at 5.10^{-5}.

The vacuum chamber. It has an interior volume of 2.5 litres and occupies 49 mm in the air-space between the bobbins. The photo shows the bobbins, the chamber and the vacuum system.



Spectrometer showing the bobbins, the chamber and the vacuum system.

The detectors. The detecting film or emulsion plate is fixed vertically to a brass support. Facing the film are two shutters, adjustable from outside the chamber, to facilitate exposition of different parts of the film. Thus, on one and the same film, the calibration lines and the rays of the source investigated are recorded.

Source supports. The two sources are 10 cm apart. The source to be investigated is brought to the same position as the standard source, with the aid of an optical system, giving an accuracy of 0.01 mm.

The diaphragm. Two brass pieces, placed at 65.5 mm from the source, form the collimating device. They are adjustable from 0.1 to 6 mm.

Preacceleration. A negative tension is applied to the source to detect electrons of very low energy. The negative electrode is a brass plate, in contact with the source. Facing the source, a grid consisting of 10 gold-wires of 50 microns, is situated at a distance of 10 mm. The maximum accelerating potential is 15KV.

Conclusion. The instrument can be employed to study very low energy electrons (< 20 Kev), using preaccelerating techniques. It is possible to replace emulsion by solid-state junctions.

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3

REALISATION OF A CONSTANT MAGNETIC FIELD, EXTENDING TO A DIAMETER OF 80 CMS, USING AIR CORED COILS.

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From the fundamental laws of magneto-static fields, Maxwell deduced that circular currents around spherical or ellipsoidal coils induce a constant magnetic field throughout the inner volume. Antony (1967) realised a homogeneous magnetic induction over a radius of 15 cms, using oblate ellipsoidal coils for his semi-circular magnetic spectrometer. He had to remove several bobbins around the median plane in order to introduce the spectrograph and compensated them by a semi-empirical method.

We propose a slightly different method, yielding a constant field over a wider region. Fig. 1 indicates two semi-ellipsoids separated by a distance of 5 cms to provide the air-space. We divide the minor axis into 30 equal parts, each unit representing a bobbin. We give below the values of $\frac{2B_0}{\mu_0 NI}$, the contribution of the respective pairs of bobbins from 0 to 40 cms at an interval of 5 cms.